Euglenophyta tested are incapable of utilizing these nitrogen compounds. The one exception, *Anacystis nidulans*, decomposes uric acid to allantoin but is incapable of further degradation. The latter organisms were not grown on xanthine. None of the algae tested utilizes either allantoin or creatinine. All but one of the phyla tested utilize ammonia and nitrate.

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Interaction of Olfactory and Other Environmental Stimuli on Implantation in the Deer Mouse

Abstract. Recently inseminated female deer mice were exposed to changes in physical environment, including size of available space, newness of environment, and a stud or strange male in order to test the hypothesis that a strange male decreases the incidence of pregnancy in recently inseminated females (Bruce effect). The data confirm the Bruce effect but also indicate that changes in physical environment produced great effects on implantation in recently inseminated females.

A number of recent publications by Bruce and her colleagues (*1*) have presented evidence for the role of olfactory stimuli in the regulation of pregnancy in the mouse. The significance of these findings is so apparent that the term "exocrinology" has been proposed for this new area of biology.

The purpose of our study was to test the "Bruce effect" in a wild, non-inbred species in order to determine the incidence of this phenomenon in species other than the laboratory mouse. Experiments were also conducted to determine whether the effect could be modified by factors other than olfactory stimuli. Consequently, these experiments examined the possible effect of changes in the physical environment and whether such changes led to behavioral-psychological disturbances which, accompanied by olfactory stimuli, might lead to failure of implantation.

The species chosen for this investigation was the deer mouse (*Peromyscus maniculatus bairdii*). This subspecies has been recently utilized in a number of comparative endocrine studies (*2*), behavioral experiments (*3*), and anatomical as well as brain studies (*4*).

Subjects used were virgin females of 45 to 60 days of age. All females were paired with a male, hereafter referred to as the stud male, in a 12- by 6- by 6-inch cage and tested for copulation by daily vaginal smears. When presence of sperm was confirmed, the male was removed and the female was isolated for 24 hours in the original cage. After the isolation period, the females were subjected to one of several conditions in which experimental variables were: presence or absence of strange or stud male, freedom or restriction of the male, and size of cage. Exposure to males in all cases was for 24 hours. All females were autopsied 7 days after insemination to determine pregnancy. Implantation occurs between 4.5 and 6 days after mating. Sizes of cages used were: 12 by 6 by 6 inches, 12 by 18 by 6 inches, and 22 by 36 by 10 inches. In the smallest cage (12 by 6 by 6 inches), males were restricted in a 4- by 2- by 2-inch wire box, but in the two larger cages males were not restricted and two sets of food hoppers, water bottles, and nest boxes were present. Twenty females were used for each group.

Our data indicate that as the size of cage increased the incidence of pregnancy in the group with no male decreased ($p = < .05$). In the group of females without a male, the incidence of pregnancy declined from 90 percent in the smallest cage to 30 percent in the largest (Table 1). Although the presence of the stud male resulted in a 30-percent reduction in pregnancy among mice housed in the smallest cage, it produced an approximate 66-percent increase in the largest cage when compared to their respective control groups. The presence of a strange male of the same species resulted in an approximate 75-percent decline in incidence of pregnancy in the smaller cages ($p = <.02$), but showed no change in the largest of the three cages.

Table 1. Number of females pregnant on the 7th day after exposure to various treatments (20 females in each group and each treatment). See text for exact size of cages.

Day 2 of treatment	No. pregnant in cage sizes indicated		
	Small	Medium	Large
Isolated	18	12	6
With same or stud male	12	13	10
With strange male	4	3	6
With empty holding cage	12		
Moved to new quarters with empty holding cage	10		

Furthermore, the introduction of an empty holding cage into the female living quarters, and change of the female to new living quarters, resulted in a 30- to 40-percent decrease in the incidence of pregnancy. In short, a change in the physical environment as well as a change in the male resulted in a decrease in the incidence of pregnancy.

That exposure of a recently inseminated female to a strange male results in a decreased implantation of fertilized ova (Bruce effect) is confirmed by the present results. However, the data also indicate that, in this particular species, odor or presence of a strange male is not the only mechanism which operates to bring about failure of implantation. Our data indicate that changes in either physical environment or social environment may result in a failure of implantation (*5*).

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